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ABSTRACT

Differences in the probability of graduating were studied for freshmen and transfer students at a metropolitan university. The study was based on students who arrived at Boise State University for the fall 1989 term (n=2,459). Of this group, 1,692 were new freshmen, and 767 were new transfers. The two groups were similar in gender and ethnicity. Follow-up groups were formed that included only students who returned for at least one additional semester: 1,121 returning freshmen and 501 returning transfer students. These groups were studied at 4, 6, and 10 years after entry. Results show that, in general, variables that were highly significant in predicting graduation at 4 years had less impact by the time 10 years had elapsed. The variables that should be included in predicting graduation remained remarkably stable. These were continuous enrollment, mainly full-time enrollment, and first semester grade point averages (GPA) for both freshmen and transfers. Transfer students had an advantage over new freshmen in reaching graduation. Freshmen closed the gap in their probability of graduating over time, but they never fully caught up. This difference was undoubtedly due in part to the number of credits transfer students brought with them. It was probably also the result of less tangible things, such as clearer goals, increased motivation, and prior experience. First semester GPA probably played the most important role in increasing the odds of graduation. This study confirms that attention should be placed on helping students be academically successful their first semester. (SLD)

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Predicting the Probability of Graduating:

Differences for Freshmen and Transfers at a Metropolitan University

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Predicting the Probability of Graduating:

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Introduction

Graduation is important. Legislators and the general public seem to think of it as the only reason students might be in college. National rankings of quality place a heavy emphasis on the percentage of freshmen who graduate. Federal reporting requires that potential students be informed of the percentage of freshmen who graduate within six years so they can make more informed decisions about where to attend college. Adelman (1999, p. 3) even calls the completion of bachelor's degrees the "Dow Jones Industrial Average of U.S. higher education."

Currently, however, most measures of graduation are limited to freshmen who began their college careers. Little attention is paid to the transfer population, even though Adelman (1999) found that more than half of the undergraduates attended more than one institution. He predicted that in the 1990s the U.S. will easily surpass a 60 percent multi-institutional attendance rate and argued strongly that such high rates of transfer make national comparisons of graduation rates an exercise in futility.

Studies that have compared the graduation rates of native freshmen and transfers have produced conflicting results. Using local data, authors such as Porter (1999) and Owen (1991) found that transfer students were less likely to graduate. Others such as Anglin et al. (1993) found graduation rates that were similar or superior to native freshman rates. These studies, however, have an institutional perspective and thus do not follow the student across institutions.

Nationally, Adelman (1999) has completed the most current and comprehensive study of bachelor's degree attainment. Using a national sample of students who were followed from tenth grade to age 30, and analyzing both high school and college transcripts, he concluded that the

variables which boosted the odds of graduating the most were continuous enrollment, transferring (especially from a community college to a four-year college), and the trend in one's college grades. He found almost no demographic variables that related to the probability of graduating, though socioeconomic status provided a very modest contribution to eventual degree completion. The academic resources that a student brought to college, best evidenced by the rigor of their high school curricula, were important, but less so than first year college grades. In addition, students who accumulated few credits their first year or had a child by age 22 significantly reduced their odds of graduating, even after ten years.

Local research (Belcheir, 1999) has shown that Boise State is an institution with a decidedly non-traditional student body, one with many of the characteristics described by Adelman. Almost half of the graduates in any given year have transferred to Boise State. Many students have families and full-time jobs. These students come and go, with about 45% of those who enroll for more than one term doing so by stopping out and then returning. Credit loads are adjusted from term to term with only slightly more than half of the freshmen who enrolled full-time their first semester remaining full-time for other semesters.

Boise State University research has also shown that transfer students graduate at higher rates than new freshmen (Belcheir, 1999), a finding much in line with Adelman's data. While the number of credits transferred provides a "leg up" on graduation, it was expected that this difference would disappear over ten years. It did not, leading to speculation that perhaps motivation or some prior experience on how to "manage" college led to improved graduation rates compared to freshmen. Adelman (1999, p. 32) has opined that "the very act of transfer embodies an intensity of commitment to higher education that results in degree completion rates equivalent to—if not higher than—those of students who do not transfer."

Purpose of the Study

This study was designed to address these major questions:

1) How much does it help to be a transfer student compared to a freshman, after accounting for known differences between the two groups? How important are the number of transfer credits in improving the odds of graduating?

2) For students who continue more than one semester, what best predicts their graduation? Are there differences between freshmen and transfers? Specifically, what role does discontinuous enrollment play in the odds of graduating, especially after ten years? Does it become less important as more time passes? How important is first semester GPA, and does that importance decrease over time? Does full-time enrollment continue to be an important predictor of graduation, even after ten years?

Graduation was checked at three points in time. Four-year graduation rates were included because that is the traditional (though increasingly unlikely) time period to graduation. Six-year rates were included since that is now the amount of time that elapses before reporting figures to the federal government. Graduation was checked ten years after initial enrollment since that seemed to be the reasonable far-end of elapsed time needed before almost all new enrollees would have either graduated or left the institution.

Methodology

Who Was Studied

The study was based on students who arrived at Boise State University for the Fall 1989 term (N=2,459). Of this group, 1,692 were new freshmen and 767 were new transfers. The two groups were similar in ethnicity and gender. About 89% of freshmen and 87% of transfers were white non-Hispanics, while 55% of freshmen and 53% of transfers were female. Freshmen were

more likely to enroll full-time (73% vs. 64%) while transfers were more likely to enroll continuously (75% vs. 70%). Transfers were also older (mean age of 24.3 vs. 20.1) and attained higher first semester GPAs (mean of 2.40 vs. 2.17). The average number of credits brought by new transfers was 32.4.

Two follow-up groups were then formed which included only students who returned for at least one additional semester. One was based on freshmen who returned at any point in the next ten fall terms (N=1,121 or 66% of the original group), while the other included transfers who returned (N=501 or 65% of the original group). These groups were formed in order to be able to include in the analysis some enrollment variables that made more sense if "one-timers" are eliminated and to answer the second research question.

Variables Included in the Study

The outcome of interest was graduation, specifically after four, six, and ten years. Re-enrollment was studied by checking each fall term file for the next ten years (through Fall 1998) to see who was still here. Students were considered graduated if they were included on any semester's graduation list through Spring semester of 1998. Students who re-enrolled after receiving a degree continued to be counted as a graduates.

The main variables of interest were initial enrollment status (freshman or transfer), form of enrollment (continuous or discontinuous), full-time vs. part-time enrollment, first semester GPA, and number of credits transferred. Students were considered mainly full-time if more than half of their semesters of enrollment were for 12 or more credits. They were considered continuous enrollees if all the fall semesters they were enrolled in were consecutive.

The demographic variables of gender, ethnicity, and age were included mainly to control for any differences that might affect the main variables of interest. It was known, for example,

that transfer students were older than freshmen so including age would help remove any effects that might obscure the overall differences between freshmen and transfers.

The Analysis

The first question of how much being a transfer student improved the odds of graduating was based on the total group (n=2,459). The other variables included in the analysis were there to remove potential differences between freshmen and transfers and included full-time and continuous enrollment status as well as age and first semester GPA. Having established that freshmen and transfers were quite different from one another (due to the number of interaction terms), the remaining questions were answered using the reduced group of students who returned for additional terms and conducting separate analyses for freshmen and transfer students. This gave more meaning to the continuous enrollment variable, so that continuous enrollment didn't include students who only attended for one fall semester.

Because graduation is a variable with only two values (yes or no), logistic regression was used to assess the probability of graduating after four, six, and ten years. The advice of Hosmer and Lemeshow (1989) helped guide the analysis. First, univariate analyses were conducted and all predictor variables with a probability level of .25 or less were retained. These were then used in multivariate analyses where simple main effects and interactions were tested. Those variables which were significant at the .05 level or smaller were retained for the final model, including any interaction terms for the major variables of interest. The results are given in terms of odds ratios that show how much the odds change as the variable changes.

Results

How did freshman vs. transfer status change the probability of graduating?

After controlling for the effects of enrollment patterns (full- or part-time, continuous vs. discontinuous), first semester GPA, and age, transfer students still had better odds of graduating compared to freshmen at all three time points. At four years, transfers were almost three times as likely to have graduated. At six years, the odds were 1.7 in favor of transfers. The odds dropped to 1.5 in favor of transfer students after ten years. The effects of all the controlling variables were also significant at the four-year mark. Except for age, all continued to play a significant role at six and ten years.

These findings are incomplete, however, since the number of credits which transfer students had completed compared to freshmen may have influenced the odds of graduating. Therefore, several additional analyses were conducted by systematically varying who was included in the transfer comparison to freshmen. These results were substantially different from the findings when all transfer students were included in the analysis (see Table 1 below). When only transfer students who had completed 15 credits or less were included as the comparison group, the differences disappeared at all three time points. When transfers with 30 credits or less were included, the odds of transfers graduating was significantly greater only at the four- and (perhaps) the six-year marks. Only when transfers with 60 credits or less were included were significant differences found between transfers and freshmen at all three time points.

Table 1. Odds of Transfer Students Graduating Compared to Freshman

When the group included transfers with:	N in group[1]	After 4 years		After 6 years		After 10 years	
		Prob	Odds	Prob	Odds	Prob	Odds
0 transfer credits	134	.0672	1.627	.5771	1.146	.6625	0.902
<=15 transfer credits	281	.0640	1.454	.2268	1.237	.5734	1.099
<=30 transfer credits	435	**.0072**	**1.573**	.0557	1.321	.1704	1.207
<=60 transfer credits	625	**<.0001**	**2.307**	**.0013**	**1.489**	**.0123**	**1.345**
any amount of credits	767	**<.0001**	**2.953**	**<.0001**	**1.703**	**.0002**	**1.513**

What Predicted the Graduation of Freshmen Who Enrolled For Multiple Fall Terms?

Continuous enrollment, mainly full-time enrollment, and first semester GPA helped predict graduation at all three time points for returning freshmen (see Table 2). Not surprisingly, freshmen who enrolled continuously were more likely to graduate than freshmen who did not. After four years, students who enrolled continuously were about twice as likely to graduate as their "stop-out" counterparts. At six and ten years, the effects of continuous enrollment couldn't be considered without also considering whether the student was mainly full-time.

Table 2. Logistic regression models for predicting graduation for freshmen who enrolled more than one fall term

Variable	Parameter Estimate	Std. Error	Wald χ^2	Pr > χ^2	Std. Estimate	Odds Ratio
After Four Years						
Intercept	-4.5179	0.4685	92.98	0.0001	--	--
Continuous enrollment	-0.7038	0.2290	9.44	0.0021	-0.193	0.495
Mainly full-time	-0.9204	0.3262	7.96	0.0048	-0.225	0.398
Age	0.0551	0.0155	12.68	0.0004	0.149	1.735[2]
1st Semester GPA	0.6176	0.1312	22.14	0.0001	0.349	1.854
After Six Years						
Intercept	-1.8905	0.2603	52.75	0.0001	--	--
Continuous enrollment	-1.2272	0.1666	54.24	0.0001	-0.336	0.293
Mainly full-time (FT)	-2.4876	0.3819	42.42	0.0001	-0.609	0.083
1st semester GPA	0.7194	0.0909	62.60	0.0001	0.406	2.053
Continuous X FT	1.4592	0.5015	8.47	0.0036	0.284	4.303
After Ten Years						
Intercept	-1.2230	0.2363	26.77	0.0001	--	--
Continuous enrollment	-0.0900	0.1502	0.36	0.5490	-0.02	0.914

[1] Each group also included 1,692 freshmen

[2] Based on each ten-year increase in age.

Variable	Parameter Estimate	Std. Error	Wald χ^2	$Pr > \chi^2$	Std. Estimate	Odds Ratio
Mainly full-time	-2.3632	0.3227	66.36	0.0001	0.35	1.868
1st semester GPA	0.6248	0.0767	66.36	0.0001	0.35	1.868
Female	-0.2831	0.1373	4.25	0.0391	-0.08	0.753
Continuous X FT	0.7956	0.4041	3.88	0.0490	0.16	2.216

For students who were mainly full-time enrollees, the odds of graduating after six years dropped dramatically for students who did NOT enroll continuously. The odds changed very little, however, for students who were part-time, probably because they hadn't accumulated enough credits to graduate in any case. After ten years, the odds were much closer for full-time enrollees, whether they enrolled continuously or discontinuously. Part-time enrollees still had much reduced chances of graduating, whether they were continuous or discontinuous enrollees. See Table 3 for details.

Table 3. Odds ratios for freshman graduation based on full-time and continuous enrollment after six and ten years

	After six years		After ten years	
Enrolled:	Continuous	Discontinuous	Continuous	Discontinuous
Full-time	1.00	0.29	1.00	0.91
Part-time	0.08	0.10	0.09	0.19

As found in prior studies of retention, first semester GPA had a strong effect on the probability of graduating. This was true whether looking at four-year, six-year, or ten-year graduation models. At the four year mark, each unit increase in GPA improved the probability of graduating by a factor of 1.85. At six years, the odds were 2.05, while at ten years, the odds improved by a factor of 1.87, all else being equal.

Demographic variables such as gender, ethnicity, and age were generally not needed to control for differences between groups. Only twice were they included in the model. For the four-year model, age was included with results indicating that being older increased the odds of

graduating for new freshmen. For the ten year model, being female increased the odds of graduating.

What Predicted the Graduation of Transfers who Enrolled for Additional Fall Terms?

The same variables were present in most of the transfer predictions that were in the freshmen predictions. Continuous enrollment, mainly full-time enrollment and first semester GPA all predicted graduation. In addition, number of transfer credits also helped predict graduation after four, six, and ten years. See Table 4 for details.

Table 4. Logistic regression model for predicting graduation for transfers who enrolled more than one fall term[3]

Variable	Parameter Estimate	Std. Error	Wald χ^2	Pr > χ^2	Std. Estimate	Odds Ratio
After Four Years						
Intercept	-2.0781	0.4719	19.40	0.0001	--	--
Continuous enrollment	-2.1723	0.8460	6.59	0.0102	-0.58	0.114
Mainly full-time	-1.3407	0.2635	25.89	0.0001	-0.35	0.262
1st semester GPA	0.3907	0.1498	6.80	0.0091	0.23	1.478
# of transfer credits	0.0323	0.0043	55.70	0.0001	0.50	1.623
Continuous X GPA	0.5848	0.2794	4.38	0.0363	0.44	1.795
After Six Years						
Intercept	0.0034	0.4884	0.00	0.9944	--	--
Continuous enrollment	-1.4263	0.2361	36.51	0.0001	-0.38	0.240
Mainly full-time	-1.5202	0.2499	37.00	0.0001	-0.39	0.219
1st semester GPA	0.5156	0.1191	18.74	0.0001	0.31	1.675
# of transfer credits	0.0189	0.0041	21.26	0.0001	0.29	1.329
White non-Hispanic	-1.0507	0.3475	9.14	0.0025	-0.18	0.350
Age	-0.0394	0.0172	5.28	0.0216	-0.15	0.961[4]
After Ten Years						
Intercept	0.0145	0.4248	0.00	0.9727	--	--
Continuous enrollment	-1.7359	0.6010	8.34	0.0039	-0.46	0.176
Mainly full-time (FT)	-1.6321	0.2308	49.99	0.0001	-0.42	0.196
1st semester GPA	0.2094	0.1397	2.25	0.1338	0.12	1.233
# of transfer credits	0.0199	0.0042	22.55	0.0001	0.31	1.348
White non-Hispanic	-0.6432	0.3183	4.08	0.0433	-0.11	0.526
Continuous X GPA	0.5412	0.2163	6.26	0.0123	0.41	1.718

[3] Based on each 15 credits accrued.

[4] Each ten-year decrease in age improved the odds of graduating by 1.483.

The impact of transfer credits was an area of particular interest since it provided a possible explanation of why transfer students were generally more likely to graduate than were freshmen. For this study, after four years, each 15 credits increased the odds of graduating by 60%. After six and ten years, each 15 credits increased the odds of graduating by 30%. Thus, the boost to graduation was highest early on and then leveled out.

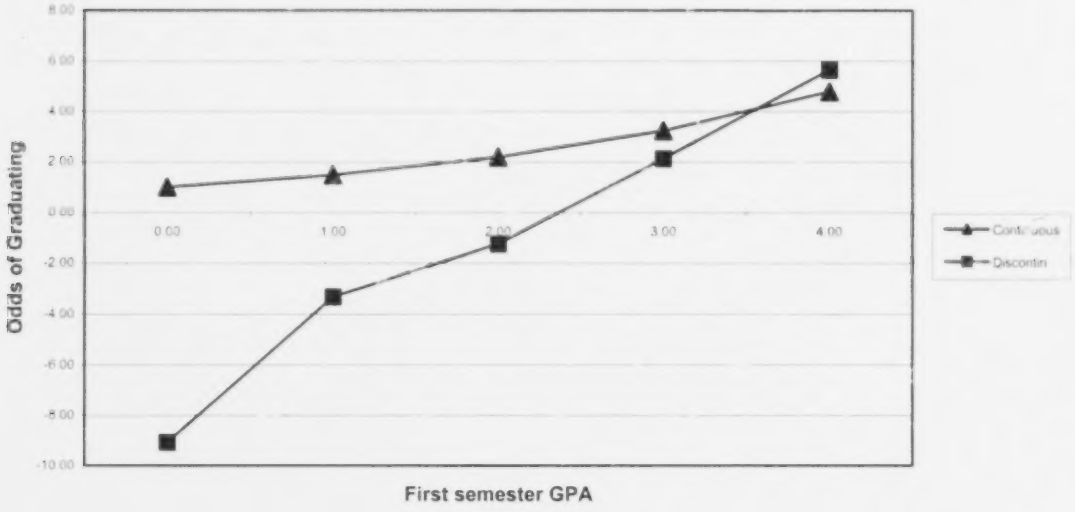
Although transfer credits were a significant help in reaching graduation, the effect was actually more potent for some other variables. Mainly full-time enrollment, for example, was an especially strong predictor, even as long as ten years after initial enrollment. Transfers who were mainly full-time had odds of graduating that were 3.8 times greater after four years, 4.6 times greater after six years, and 5.1 times greater after ten years. This trend over time was contrary to expectations since given more time, one would assume that taking more credits would be less important.

Continuous enrollment also had a strong impact on the odds of graduating. After six years, continuous enrollees were four times more likely to have graduated. At both the four- and ten-year time points, however, discussion of the effect had to account for the level of GPA performance the first semester at Boise State. Further analysis indicated that transfer students who performed very poorly their first semester were especially handicapped in reaching graduation if they then enrolled discontinuously. As students attained higher GPAs, however, this disparity in odds of graduation disappeared between the continuous and discontinuous enrollees. Figure 1 illustrates the relationship using continuous enrollees who attained a 0.00 GPA their first semester as the group to which all other groups are compared.[5] It is obvious from

[5] To better illustrate the magnitude of the differences, odds ratios of less than 1.0 were transformed into reverse odds and given a negative sign, e.g., an odds ratio of .11 became –9.09.

the graph that first semester GPA is highly predictive of graduation, especially for discontinuous enrollees.

Figure 1. Odds of Graduating after Four Years Based on GPA and Continuous Enrollment



	First Semester Grade Point Average				
Odds of Graduating	0.00	1.00	2.00	3.00	4.00
Continuously enrolled	**1.00**	**1.48**	**2.18**	**3.23**	**4.77**
Discontinuously enrolled	**0.11** *(- 9.09)*	**0.30** *(- 3.33)*	**0.80** *(-1.25)*	**2.13**	**5.64**

As found for the freshmen, few of the demographic variables were needed as controls for the study. Age was significant at the six-year mark, with younger transfers being more likely to graduate than their older counterparts. Ethnicity was also a significant factor at the six and ten-year mark. At six years, white non-Hispanics were almost three times as likely to graduate as their minority counterparts, while at ten years they were almost twice as likely to graduate.

Summary and Conclusions

This study sought to answer the question of what predicted graduation and if these predictions were modified as the time to graduation moved from four to six to ten years. In

terms of the effect of time, results showed that, in general, variables that were highly significant in predicting graduation at four years had less impact by the time ten years had elapsed. However, what should be included in predicting graduation remained remarkably stable. These variables were continuous enrollment, mainly full-time enrollment, and first semester GPA for both freshmen and transfers.

This study further confirmed the advantage that transfer students had over new freshmen in reaching graduation. Though freshmen closed the gap in their probability of graduating over time, they never fully caught up. That this difference was undoubtedly due in part to the number of credits which transfer students brought with them to the institution was shown by analyzing various "subsets" of the transfer group. When students transferred few credits, their odds of graduating were similar to freshmen odds. However, as students with 30 or more credits were also included in the transfer group, the odds improved significantly.

The transfer students' edge, however, was also probably due to less tangible things such as clearer goals, increased motivation, and prior experience that was gained from already attending college at least once. Recall that Adelman (1999) found that transfer students had a graduation advantage, even though his national study nullified the effects of transfer credits at any particular institution. In fact, in the act of transferring, students probably lost credits that had previously applied toward graduation at a prior institution. Berkner et al. (1996) using national data also found that transfer students exhibited the highest composite rate of attainment/persistence.

Continuous and full-time enrollment were variables which had somewhat different roles for freshmen and transfers. For freshmen, at the four-year mark, both variables more than doubled the odds of graduating. After the four-year mark, the effects of one couldn't be

explained without also including the other. For mainly full-time enrollees, enrolling discontinuously had a strong impact on the odds of graduation after six years, while the effect was small for part-time enrollees. After ten years, however, the effects of discontinuous enrollment were more minor for both groups. Thus, it appears that freshmen should first be advised that continuous and full-time enrollment will help them reach graduation in the most timely fashion (with mainly full-time and continuous enrollees having odds of graduating that were ten times those of part-time and discontinuous enrollees after six years). If they cannot attend continuously and full-time, it is better to attend full-time and take a semester off here and there than it is to enroll part-time and enroll continuously, according to the odds.

For transfers, full-time enrollment had a strong effect that increased somewhat over time so that after ten years, mainly full-time transfer students were five times more likely to have graduated than there part-time counter parts. The effects of continuous enrollment, on the other hand, were generally tied to how well the transfer students performed their first semester with the effects of first semester GPA showing a much stronger relationship for discontinuous enrollees than continuous enrollees.

Indeed, first semester GPA probably played the most important role in increasing the odds of graduation. The impact was clear in predicting freshman graduation for those who returned for additional fall semesters. In this case, each unit increase in GPA approximately doubled the odds of graduating at four, six, and ten years. Thus, a student with a 4.00 GPA would be approximately sixteen times more likely to graduate than a student with a 0.00 first semester GPA. Prior studies have shown the importance of this variable in predicting retention, and this study extends those findings to graduation.

For transfers, the effects of GPA and continuous enrollment generally were bound together with GPA showing a stronger effect for discontinuous enrollees. For example, for continuous enrollees, those with a 4.00 GPA were almost five times as likely to graduate after four years as those with a 0.00 GPA, but for discontinuous enrollees, the difference was fifty times. Considered another way, transfer students who performed poorly their first semester (i.e., 0.00 GPA) but continuously enrolled were nine times more likely to have graduated after four years than their discontinuously enrolled counterparts. However, for those at high GPA levels, the difference between continuous and discontinuous enrollment was insignificant. Thus, first semester GPA always made a difference in the odds of graduating, but the greatest difference was for students who dropped in and out. Transfer students who perform poorly their first semester should be advised to continue and not stop their studies.

Though the demographic variables of age, ethnicity, and gender were included in the study, they generally had little effect on the prediction of graduation. For freshmen, students who were older were more likely to graduate after four years and women were more likely to graduate after ten years. For transfers, younger students were more likely to graduate after six years. Only one demographic variable showed much consistency: white non-Hispanic transfer students were more likely to graduate after six and ten years, an indicator that extended time to graduation may be problematic for minority transfer students.

In terms of policy, this study confirms that attention should be placed on helping students be academically successful their first semester. This is the variable with the strongest effect on the odds of graduating. It is also where the university has the most control. It is probably easier to put in place academic aid than it is to make changes that will cause students to attend full-time and continuously. While increased financial aid would probably also increase the number of

continuous, full-time enrollees, finances are often not the only consideration for students, especially those at metropolitan universities.

Universities also may want to consider more aggressively pursuing new transfer students. Both local and national studies indicate that this is a group that is more likely to succeed in college. More transfer students translate into more enrollments in upper division courses, which are funded at higher levels than lower division courses and which half of new freshmen never reach. In addition, more transfer students mean more graduates of the university, something which can only benefit the institution in the long run.

References

Adelman, C. (1999). Answers in the tool box: Academic intensity, attendance patterns, and bachelor's degree attainment. Washington, D.C.: U.S. Department of Education.

Anglin, L. W., Davis, J. W., & Mooradian, P. W. (1993, April). Do transfer students graduate? A comparative study of transfer students and native university students. Paper presented at the 1993 Annual Meeting of the American Educational Research Association, April 1993, Atlanta, Georgia. (ED 355979)

Belcheir, M. J. (1999). Ten year enrollment and graduation patterns for 1989 new freshmen and transfers. Boise, Idaho: Boise State University Office of Institutional Assessment (Research Report 99-04).

Berkner, L. K., Cuccaro-Alamin, S., & McCormick, A. C. (1996). Descriptive summary of 1989-90 beginning postsecondary students: 5 years later. Washington, DC: National Center for Education Statistics.

Hosmer, D. W., and Lemeshow, S. (1989). Applied logistic regression. New York: John Wiley and Sons.

Owen, J. A. (1991, May). A comparative analysis of the academic performance and graduation rates of freshmen and transfer students. Paper presented at the annual meeting of the Association for Institutional Research, May 1991, San Francisco, California. (ED 336022)

Porter, S. (1999, May). Assessing transfer and native student performance at four-year institutions. Paper presented at the annual meeting of the Association for Institutional Research, May 1999, Seattle, Washington. (ED 433790)